_____ (U.S. Patent Application Serial No. 09/618,759, filed July 18, 2000) and is hereby incorporated by reference. This extracorporal circuit provides blood flows of 10 to 60 ml/min, which is sufficient to remove excessive fluids from the blood via ultrafiltration. A straightforward dependency exists between the amount of ultrafiltrate removed from the blood and the flow (volume per unit time) of blood that passes through the filter. Blood condenses in the filter. In practice approximately 20% to 30% of the ultrafiltrate volume can be safely removed from the blood as filtrate. If more is removed, the blood becomes too dense with red blood cells and protein and will flow sluggishly. By removing 20% to 30% as ultrafiltrate, sufficient excess fluid may be removed by filtering just 2% or less of the total cardiac output of the patient. This 2% of cardiac output can be removed through peripheral veins. Thus, an ultrafiltrate system has been developed that requires only peripheral vein access.

The proposed invention integrates single use pressure sensors with the single use blood set. After being used on one patient, the entire set including the pressure sensors is discarded. Disposable pressure sensors are a part of the disposable blood circuit. The integrated sensors do not disturb the laminar blood flow inside the bloodline since the internal diameter of the sensor element is the same as of the blood tubing (3.2 mm or 4.5 mm). The sensing element is less than 5 mm in diameter and is embedded flush in the wall of the sensor housing. The housing is bonded flush with the internal wall of the blood line tube to form a continuous channel. Although similar disposable blood pressure sensors (such as ones made by Merit Medical of Utah) are used widely for invasive blood pressure measurement this design has never been previously used in an apparatus for fluid removal or as an integral part of a extracorporeal blood treatment set.